CLAIMS:

1.   An image processing method for extracting a thread-like structure (GW) represented on the background in a digital noisy original image (IM1), comprising steps of acquisition (1) of the original image data and steps of:

extraction (2) of pixel strings (A1,A2,.) of a same threadlike structure;

5   operation (4,5) of a Phase (Intra-Set Phase, Extra-Set Phase) automatically yielding one Best String (A) from the pixel strings (INSI,EXSI) for representing the threadlike structure (GW).

2.   An image processing method as claimed in Claim 1, wherein the Phase (4),

10   called Intra-Set Phase, comprises the steps of : forming a String Set with the pixel strings and, inside said String Set, forming (43) a set of Candidate Paths (IM4) linking couples of End-Points of the pixel strings, and selecting (44) one Best Candidate Path as Best String in the considered String Set (INSI).

15   3.   An image processing method as claimed in Claim 2, wherein the Intra-Set Phase comprises steps of : Front Propagation between the couples of End-Points of the pixel strings inside the considered String Set for providing a set of Candidate Paths among which the Best String is selected.

20   4.   An image processing method as claimed in Claim 1, wherein the Phase, called Extra-Set Phase comprises steps of : determining adjacent couples of pixel strings having opposite End-points, forming sets of Connection Paths (IM6), outside the pixel strings, linking the opposite End Points of said adjacent couples, selecting respective Best Connection Paths for linking the couples of pixel strings and forming one Best String from

25   the linked pixel strings (EXSI).

5.   An image processing method as claimed in Claims 4, wherein the Extra-Set Phase comprises steps of : Front Propagation between the couples of opposite End-Points of

the pixel strings, outside the pixel strings, for providing the sets of Connection Paths among which the Best Connection Paths are selected.

6.   An image processing method as claimed in one of Claims 1 to 5, comprising steps of:

extraction (2) of elementary pixel strings (A1,A2,.) associated in string sets (SA), each of a same threadlike structure (IM2);

operation (4) of a First Phase (Intra-Set Phase) automatically yielding one Best String (A) per string set (INSI) for representing the threadlike structure (GW).

7.   An image processing method as claimed in Claim 6, comprising steps of:

operation (5) of a Second Phase (Extra-Set Phase) automatically yielding one Final Best String (FBS) by linking Best Strings (EXSI), for representing the threadlike structure (GW).

8.   An image processing method as claimed in one of Claims 6 or 7, wherein the First Phase (Intra-Set Phase comprises the steps of : inside a considered string set, formation of couples of End-Points of elementary strings, formation (43) of a set of Candidate Paths (IM4) linking said couples of End-Points, and selection (44) of one Best Candidate Path as Best String (INSI).

9.   An image processing method as claimed in Claim 8, wherein the First Phase (Intra-Set Phase) comprises steps of : Front Propagation between the couples of End-Points of the elementary strings inside a considered String Set for providing a set of Candidate Paths among which the Best String is selected.

10.   An image processing method as claimed in one of Claims 6 to 9, wherein the Second Phase (Extra-Set Phase) comprises : outside each string set, formation of couples of Best Strings and of couples of opposite End-Points of said couples, formation of sets of Connection Paths (IM6) linking said opposite End Points, selection of one Best Connection Path for linking each couple of Best Strings and of one Final Best String among the Best Strings connected by Connection Paths (EXSI).

11.   An image processing method as claimed in Claims 10, comprising in the Second Phase (Extra-Set Phase) steps of : Front Propagation between said opposite couples of End-Points of the Best Strings outside the String Sets for providing the sets of Connection Paths among which the Best Connection Paths are selected.

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12.   An image processing method as claimed in one of Claims 6 to 11, comprising, preliminary to the Phase that is first carried out, a step of ridgeness calculation, forming (3) a ridgeness data image (IM3), where ridge pixels show an intensity gradient that is maximum in a first determined direction in its neighborhood, and show a lower intensity gradient in a

10   direction perpendicular to said first direction, so as the more an image structure is formed of pixels verifying this gradient property, the more the ridgeness measure of the image structure is high.

13.   An image processing method as claimed in Claim 12, comprising : the

15   formation (42) of a First Potential Image (IP1) from the ridgeness data image, where the potentials of the pixels belonging to the considered string set are set to first values, lower than a given predetermined value, the potentials of pixels of the other string sets are set to second values, higher than said predetermined value, and the pixels located outside the string sets are attributed potentials whose values are function of their ridgeness data values, a Front

20   Propagation operation (43) propagating on the lower potentials in the First Potential Image (IP1) and forming the Candidate Paths (IM4) between couples (41) of End-Points of the elementary strings.

14.   An image processing method as claimed in one of Claims 6 to 13, the

25   comprising : the determination (51) of the opposite End-Points of couples of Best Strings, the formation (52) of a Second Potential Image (IP2) from the Best String image (INSI), where all the string pixels are attributed higher potentials, and the other pixels are attributed lower potentials than a given predetermined potential value, a Front Propagation operation (53) propagating on the lower potentials in the Second Potential Image (IP2) and forming the

30   Connection Paths (IM6) between couples (51) of opposite End-Points of the couples of Best Strings.

15.   An image processing method as claimed in one of Claim 6 to 14, wherein the selection operation of the Intra-set and Extra-Set Phases are operated using criterions based on the height of ridgeness of the structures of the Paths.

5   16.   A system comprising a suitably programmed computer or a special purpose processor having circuit means, which are arranged to process image data according to the method as claimed in any one of the preceding Claims.

17.   An examination apparatus having means for acquiring medical digital image

10   data and having a system having access to said medical digital image data for carrying out a processing method according to one of Claims 1 to 15, and having display means for displaying the medical digital images and the processed medical digital images.

18.   A computer program product comprising a set of instructions for carrying out

15   a method as claimed in one of Claims 1 to 15.